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*NATIONAL INSTITUTE OF
STANDARDS AND TECHNOLOGY*

*ATP's Management of Intramural
Research Can Be Strengthened*

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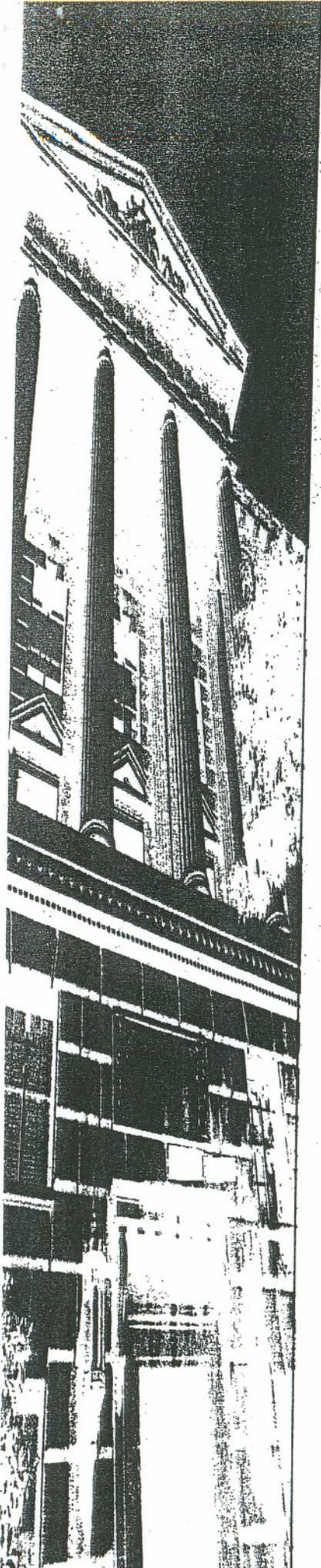


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EXECUTIVE SUMMARY

The Advanced Technology Program (ATP) is a program administered by the National Institute of Standards and Technology that assists private companies in carrying out research on high-risk technologies that will enable them to develop products, services, and manufacturing techniques. For the period covered by our review, fiscal year 1998, the ATP appropriation was \$192.5 million. Through the use of cooperative agreements, the program has provided millions of dollars in financial assistance to U.S. businesses. In addition, the ATP statute (15 U.S.C. 278n) permits the program to use up to 10 percent of its appropriation internally for standards development and technical activities in support of ATP's mission. For fiscal year 1998, ATP funded 114 projects for \$13.8 million.

Intramural projects refer to research and development projects performed by NIST scientists and paid for with ATP appropriations. We examined the criteria, procedures, and practices for the solicitation, review, and selection of these projects, and found they appear to be designed to result in funding decisions that meet the ATP legislative requirements. Requirements include (1) the total amount of intramural funding cannot exceed 10 percent of ATP's appropriation, (2) the research must be directed toward standards development and technical activities that support ATP's mission, and (3) the ATP managers must avoid giving undue advantage to specific companies.

We found that ATP officials have generally been addressing problems relating to the intramural projects as they arise. For instance, in 1997 ATP officials revised the selection criteria to emphasize generic research that is directed toward solving an industry problem rather than research directed toward a specific company's problems. By funding generic research, ATP helps counter any perception that ATP might be giving undue advantage to specific companies and also expands the benefits of the research industry-wide.

However, our review of the 114 fiscal year 1998 project files identified the following opportunities for improvement:

- **ATP's formal written policies and procedures for intramural projects should be updated to reflect the current process.** In addition, to ensure that all NIST scientists are fully aware of availability of intramural funds, the updated policies and procedures should be included in the *NIST Administrative Manual* (see page 2).
- **ATP should ensure that its policies and procedures emphasizing generic research and requiring approval of collaborations are followed.** For 14 projects, we found that the research appeared closely linked to a specific ATP grant, and for 15 projects NIST scientists did not obtain approval for their outside collaborations as required by its policies and procedures (see page 5).

- **Project performance should be evaluated.** According to ATP managers, they evaluate the intramural projects based upon such things as final project reports, contributions to workshops, and publication of papers. However, we found little evidence of these evaluations. In addition, some project files did not include sufficient information to properly evaluate the project (see page 9).
- **More effective methods for disseminating research results could help improve program impact.** For example, two of three ATP grantees we contacted were unaware of potentially beneficial research. Although this small sample is not statistically significant, it does raise concerns as to whether ATP's current practices of relying on workshops and conferences to publicize this work are sufficient (see page 10).
- **Project files should contain written documentation of management decisions and oversight, as well as copies of needed approvals.** Without such evidence, ATP managers cannot effectively demonstrate that they are properly monitoring the projects and ensuring that all approvals have been obtained before releasing funds (see page 12).

Recommendations

We recommend that the Director of NIST:

- Revise ATP's formal written policies and procedures for intramural funding to accurately reflect the policies and procedures now being practiced, and include the updated policies and procedures in the *NIST Administrative Manual* (see page 4).
- Address concerns about appropriate research and collaborations by (1) strengthening ATP's program managers' monitoring of intramural projects by developing and implementing procedures that require the managers to meet regularly with NIST scientists during the projects to discuss the research and ensure that all collaborations are disclosed; (2) clarifying the types of collaborations that require approval; and (3) providing additional training to all NIST scientists on the policies and procedures governing generic research and collaborations (see page 7).
- Ensure that all final reports include the information needed to evaluate performance and track accomplishments, and develop and implement policies and procedures that (1) require ATP managers to evaluate performance, and (2) link the intramural funding results to ATP's performance measures and goals (see page 10).
- Develop additional methods for disseminating the results of intramural research, including posting notices of ongoing research topics and copies of final reports on NIST's Internet web site (see page 11).

- Implement policies and procedures requiring that the intramural project files contain written documentation that meets GAO internal control standards. At a minimum, these policies and procedures should require that program managers document management decisions, and keep copies of required approvals and authorizations (see page 13).

NIST's response generally indicated that it believes it is already compliant with all but one of the suggested improvement areas. NIST agreed that formal evaluations of the projects are needed and agreed to implement our recommendation to ensure that all final reports include the information needed to evaluate performance and track accomplishments. For the other areas, NIST replied that ATP already has updated policies and procedures for selecting projects and its existing policies for disseminating research results, monitoring projects, and documenting project files are sufficient. Nevertheless, NIST agreed to clarify the types of collaborations that need approval. It also agreed to provide training to the scientists on the policies and procedures governing generic research and collaborations, and the need for discussing and documenting major changes to the project.

For the recommendations that NIST publish the intramural project policies and procedures in the NIST *Administrative Manual*, require ATP program managers to hold formal meetings with the NIST scientists, and find alternative methods for disseminating the project research results, NIST did not agree or disagree. Instead, it stated that it would either consider or take under advisement our recommendations. Based upon NIST's comments, we have clarified the report as necessary. However, we do not find a basis for changing our findings, and we reaffirm our recommendations.

We have included a summary of NIST's response and our comments following each recommendation. NIST's entire response is included as Appendix II.

INTRODUCTION

The Advanced Technology Program (ATP) is a program administered by the National Institute of Standards and Technology that assists private companies engaged in high-risk technical research that offers the potential for significant economic benefits. Through cooperative agreements, NIST provides millions of dollars to single companies and joint ventures to perform the research necessary to enable them to develop new products, services, and manufacturing techniques. In fiscal year 1998, ATP received \$192.5 million in appropriations.

In addition to authorizing NIST to provide financial assistance to U.S. businesses, the ATP statute (15 U.S.C. 278n) permits NIST to use 10 percent of the ATP funds internally for standards development and technical activities in support of the program's mission. For fiscal years 1996 through 1998, NIST sponsored 366 such intramural projects at a cost of about \$35 million. For fiscal year 1998, ATP funded 114 intramural projects for \$13.8 million.

PURPOSE AND SCOPE OF AUDIT

The objective of our audit was to evaluate ATP's management of its intramural projects. We examined the authority and criteria for using intramural funds on in-house research and development projects. We reviewed the adequacy of ATP's selection process, including the criteria, procedures, and practices for the solicitation, review, and selection of the projects. We also determined whether ATP followed its own policies and procedures in selecting and funding fiscal year 1998 intramural projects. Finally, we assessed how well ATP monitored the ongoing projects, and whether it had adequate procedures for evaluating performance. Our findings and recommendations are based on examinations of the 114 fiscal year 1998 intramural projects totaling \$13.8 million, interviews with NIST and ATP officials, and evaluations of pertinent documents and financial information, including NIST policies, procedures, and guidance. We also interviewed several ATP grantees. Our work was performed from October 1998 through August 1999 at NIST headquarters in Gaithersburg, Maryland.

We identified the Omnibus Trade and Competitiveness Act of 1988, as amended by the American Technology Preeminence Act of 1991, as ATP's authorizing and governing legislation for funding intramural projects. Our evaluation of ATP's compliance with the statute found no instances of noncompliance. Our evaluation of internal controls found that ATP needs to improve its administrative management by updating its policies and procedures, reviewing project performance, and better documenting key decisions and approvals. These issues are discussed in Sections II, III, and V of the report. We did not test the reliability of computer-based data because we did not rely on such data.

The audit was conducted in accordance with generally accepted government auditing standards, and was performed under the authority of the Inspector General Act of 1978, as amended, and Departmental Organization Order 10-13, dated May 22, 1980, as amended.

FINDINGS AND RECOMMENDATIONS

We found that the ATP's fiscal year 1998 criteria, procedures, and practices for soliciting, reviewing, and selecting intramural projects appeared to be designed to result in funding decisions that met ATP's statutory requirements. We also found that the program has generally been addressing problems as they arise. For instance, in 1997 ATP discontinued its practice of funding projects directly related to a specific ATP grantee's technical problems. Instead, ATP is now emphasizing projects that address problems experienced by a number of companies. Not only does this approach address concerns that ATP might be giving undue advantage to specific companies, it also expands the benefits of the research industry-wide.

In addition, ATP officials have instituted controls for avoiding intellectual property disputes and ensuring that research results are placed in the public domain. Laboratory division directors must either certify that no non-NIST employees are working on the project or obtain approval for the participation of non-NIST employees from ATP management and NIST's Deputy Chief Counsel for Technology. Further, ATP funds are withheld until any required clearances, such as material transfer agreements, are obtained.

Nevertheless, we identified the following opportunities for increasing the effectiveness of ATP's intramural funding.

I. Selection Process Is Adequate, but Policies and Procedures Are Not Up to Date

We found ATP's selection process for intramural projects to be adequate for selecting intramural projects that meet legislative requirements. However, ATP's written policies and procedures, which date back to 1993, do not reflect the current process and should be updated. We also found that ATP's policies and procedures have not been published in the NIST *Administrative Manual*. Up-to-date, formally issued policies and procedures are needed to ensure that all NIST scientists are fully aware of the process for obtaining intramural funds.

ATP's intramural projects are not financial assistance awards and therefore do not fall under the criteria established for such awards. Thus, NIST developed its own internal guidelines, policies, and procedures for soliciting, reviewing, and selecting intramural projects for funding. The process must meet the following legislative requirements:

- The total amount funded cannot exceed 10 percent of ATP's appropriation.
- The research must be directed toward standards development and technical activities in support of ATP's mission.
- ATP managers must avoid giving undue advantage to specific companies.

The process used for fiscal year 1998 selections is as follows. The ATP director reviewed the program's appropriation and budget to determine how much funding was available for intramural projects. Historically, this has been about 5 percent of ATP's budget. For fiscal year 1998, these funds were included in the \$42.5 million set-aside by the Congress for administration, NIST laboratory support, and Small Business Innovation Research requirements. In turn, the funds were allocated by ATP's executive director to the three technical offices: Chemistry and Life Sciences; Information Technology and Applications, and Materials and Manufacturing Technology, based on the value of each office's ongoing cooperative agreements. Funding opportunities and procedures for submitting proposals for the upcoming fiscal year projects were announced via ATP's internal web page prior to the close of fiscal year 1997.

The program managers of ATP's technical offices selected the projects for intramural funding. Projects must target industry-wide problems and promote new capabilities in the laboratory. Interested scientists contact the program managers to discuss the proposed work, research objectives, and estimated costs. When the program manager approved the proposed research idea and objectives and agreed with the costs, the NIST scientist submitted a brief research proposal. The proposal included a project title and estimated costs; a brief summary of the research objectives, approach, and milestones; and a discussion of the project's relationship to ATP's program objectives and the laboratory mission. If non-NIST researchers, including guest researchers, contractors, and CRADA partners,¹ are going to work on the intramural project, they must be approved in writing by ATP and NIST's Deputy Chief Counsel for Technology before they can begin work. Material transfer agreements, non-disclosure forms, or cooperative research and development agreements are required if proprietary information or samples are expected to be involved.

Once the program manager approved the project and all other necessary approvals were obtained, the funds were transferred to the laboratory. Projects could be for either one year or multi-years, but all were funded one year at a time. At the end of the year, the scientist had to submit to ATP an acceptable final report on the research results and progress before the scientist could receive the next year's funds. For fiscal year 1998, the average project funded was about \$121,000.

Based on our review, we concluded that the selection process followed by ATP in fiscal year 1998 was sufficient for funding intramural projects that met ATP legislative requirements. As noted above, this process was included, along with the guidance for submitting proposals and final reports, in a memorandum signed by the ATP Director. In addition to the memorandum, NIST also has formal written policies and procedures. These were given to us by ATP officials at the beginning of the audit. We found that these were last revised in 1993 and did not include the policy and procedural changes made since that time. For instance, in 1997, ATP revised its

¹Cooperative Research and Development Agreements (CRADAS) are joint research efforts in which NIST and its partner provide staff, equipment, and/or funds for a project of mutual interest.

selection criteria to emphasize generic research rather than research directed toward a specific ATP grantee's problems. The purpose of the change was to avoid appearances of favoritism and also expand the benefits of the intramural research results. However, our copy of ATP's written policies and procedures still required that intramural projects be directly linked to specific ATP grantee problems.

GAO *Standards for Internal Controls in the Federal Government* provides guidance to help agencies establish and maintain effective internal control systems. These standards specifically include policies and procedures as an important control activity to ensure that management directives are properly enforced. Furthermore, GAO specifies that policies and procedures describing internal controls be documented. Because ATP's written policies and procedures do not reflect the current selection process, they do not comply with GAO's internal control standards.

Also, we found that the policies and procedures for intramural projects are not included in NIST's *Administrative Manual*. The manual is NIST's official medium for informing staff of formal policies, procedures, and other information needed for effective administration and operation. Although ATP announces the availability and process for obtaining intramural funds on its internal web page, the entire set of policies and procedures should also be published in the manual to comply with NIST directives, which require that all formal policies and procedures be included in the manual. Moreover, publishing accurate and complete policies and procedures in the manual will help ensure that all interested NIST scientists are fully aware of the availability of and the process for applying for ATP funds.

Recommendation

We recommend that the Director of NIST revise the program's formal written policies and procedures for intramural funding to accurately reflect the policies and procedures now being practiced, and include the updated policies and procedures in the *NIST Administrative Manual*.

NIST Response

In its response, NIST disagreed with our finding that it needs to update its formal written policies and procedures. It argued that it already has written policies and procedures for intramural funding which it updates and transmits each year in a memorandum signed by the ATP director. According to NIST, the memorandum provides the guidance the NIST scientists need for applying for intramural funding. NIST also requested that we delete the statement that its written formal policies include the requirement that ATP projects be directly linked to specific ATP grantee problems. According to ATP, that statement is inaccurate because it revised the policy in FY 1997. Finally, NIST said it would take into consideration our recommendation to include the policies and procedures in NIST's *Administrative Manual*.

OIG Comments

We agree that NIST issues an updated memorandum each year, and revised our report accordingly. However, a memorandum is a method for disseminating information and is *not* NIST's official medium for formal publication of policies and procedures. As we point out in the report, Chapter 4 of the NIST *Administrative Manual* requires that policies and procedures be published in the manual. In addition, we were given a copy of ATP's official intramural project policies and procedures. These dated back to 1993, had not been updated, and, as a result, did not match the policies and procedures included in the current year's memorandum. Moreover, we found that having two different sets of policies and procedures can be confusing. To end this confusion and comply with NIST directives, NIST needs to have one official set of policies and procedures that are published in its *Administrative Manual*. Accordingly, we affirm our recommendation.

In regard to NIST's response that our report includes an incorrect statement about the link between intramural projects and ATP grantee problems, we disagree. We use the sentence as an example to show that the copy of the official intramural project policies and procedures we were given included policies that were no longer in effect. Our report clearly states that ATP revised its policy and no longer funds projects that are closely linked to specific ATP grantees. However, these revisions were not reflected in the intramural project's official policies and procedures. Accordingly, we did not revise our report.

II. Concerns About Appropriate Research and Collaborations Remain

Our review of 114 intramural project files identified 14 projects in which the NIST scientists indicated that they worked closely with an ATP grantee, thus providing a direct benefit to a specific ATP project. The ATP statute specifically states that the ATP program should avoid giving "undue advantage" to specific companies. We also identified 15 projects in which NIST scientists did not receive approval for their outside collaborations. These approvals are required by current ATP policies.

NIST began addressing concerns about ATP's intramural projects in 1994, when, at the urging of its Research Advisory Committee, the agency issued guidelines for laboratory interaction with ATP. Of particular concern to the committee was the appearance of conflicts of interest. Some ATP proposers apparently believed that interacting with NIST scientists improved their chances of receiving an award. The guidelines contain several principles that address NIST scientists' behavior, such as requiring them to treat all ATP applicants fairly and prohibiting them from participating in a company's ATP proposal process.

Even with the guidelines, questions concerning NIST scientists and ATP grantees apparently persisted. ATP managers wanted to ensure that the laboratories were not performing research or providing measurements, calculations, or similar work that the company or joint venture was required to perform itself under the award. Consequently, in 1997 ATP revised its policies and

procedures. ATP officials discontinued funding research closely linked to work being done by a specific ATP grantee, and began emphasizing generic research. By adopting a broad-based approach, the program would no longer appear to be providing undue assistance to individual grantees. At the same time, the research would benefit an entire industry rather than just one company or joint venture.

Yet, in spite of the policy change, we found that in 14 of the 114 projects reviewed, NIST scientists appeared to be working on projects closely linked to a specific ATP grant. For instance, the intramural proposal for a component-based software tool project referred to the NIST scientists' close ties with the grantee and included as its milestones developing new components for the ATP grantee's proprietary software and making those components available to the grantee's customer base. In another example, NIST researchers working on a magnetic hard disk project included ATP grantees as members of their research team. Also, a catalytic polymerization project proposal described teaming arrangements between NIST scientists and an ATP grantee and noted that similar collaborations with other ATP grantees would be established as "interest warrants."

Concerns over private ownership of intellectual property and public dissemination of research also played roles in ATP's decision to revise its policy. ATP and NIST officials became aware that the intramural program was generating a considerable amount of intellectual property. The officials were concerned that the research results were considered proprietary information by the companies working with the NIST scientists, and thus not being published. Moreover, to the extent that NIST could not release the research results to ATP grantees, the research would no longer be benefitting ATP. Thus, ATP would be in violation of its statute. Finally, managers and the NIST Deputy Chief Counsel for Technology worried about the NIST scientists' access to the proprietary information and trade secrets of the outside collaborators.

To address these concerns, ATP instituted procedures to protect NIST's right to the research results. Scientists must obtain approval from ATP and NIST's Deputy Chief Counsel for Technology for any outside collaborations or have the laboratory division director certify that "NIST employees only perform all research." ATP also holds meetings between the NIST Deputy Chief Counsel and NIST scientists when questions concerning proposed collaborations arise.

Nevertheless, we found that in 15 of 114 projects reviewed, scientists were still entering into collaborations without approval, sometimes after having certified that only NIST employees would be working on the project. For instance, a project involving medical imaging through computer modeling included both the certification that no non-NIST employees would work on the project and a list of non-NIST research team members.

We identified several reasons why these practices continue:

- ATP intramural project policies do not include comprehensive procedures for administering the projects. Without such procedures, ATP managers may not be monitoring the projects to the extent needed to be fully aware of the interaction between the grantees, non-NIST personnel, and NIST scientists. In several instances, although the proposals were written generically and did not refer to any collaborations, the final report indicated that the NIST scientist worked on a problem related to a specific ATP grant or collaborated with outside scientists.
- There appears to be confusion as to what types of collaborations need to be approved. For instance, the proposal procedures address only formalized collaborations, such as guest researchers or cooperative research and development agreement partners. Yet we understood from our discussions with NIST's Deputy Chief Counsel for Technology and ATP officials that all outside collaborations, including informal collaborations, were required to be approved.
- Training was not sufficient. ATP does not have formal training sessions on the policies and procedures for requesting intramural funding. Instead, ATP meets with scientists when issues or questions concerning individual research projects arise. Consequently, scientists may not fully understand the policies and procedures they are expected to follow.

Recommendation

We recommend that the Director of NIST address concerns about appropriate research and collaborations by (1) strengthening ATP's program managers' monitoring of intramural projects by developing and implementing procedures that require the managers to meet regularly with NIST scientists during the projects to discuss the research and ensure that all collaborations are disclosed; (2) clarifying the types of collaborations that require approval; and (3) providing additional training to all NIST scientists requesting intramural funding on the policies and procedures governing generic research and collaborations.

NIST Response

NIST agreed to clarify the types of collaborations requiring approval and provide training to all NIST scientists on the policies and procedures governing research and collaborations. NIST further stated that it will take under advisement our recommendation to have regular meetings with the NIST scientists. However, NIST disagreed with our report conclusion that 14 projects appeared to involve NIST scientists working closely with ATP grantees, stating that ATP's policies would not permit these types of projects to be approved. According to NIST, as auditors we did not understand the science and did not obtain explanations from ATP project managers.

NIST stated that approvals were received for all collaborations, although it admitted that some approvals may not have been documented and that improvements can be made in documentation. Accordingly, NIST stated that it has instituted a procedure whereby the administrative staff maintains a record of all projects that received NIST legal review. NIST also explained that some informal collaborations may not always require approval because they do not present a risk of losing intellectual property rights.

OIG Comments

We are pleased that NIST agreed to implement our recommendations to clarify the types of collaborations requiring approval and provide training to all NIST scientists. We also are aware that ATP has informal discussions with the NIST scientists. However, without documentation on when, where, or what was discussed, these meetings will not meet the intent our recommendation. Accordingly, we reaffirm our recommendation that ATP hold regular documented meetings with NIST scientists to discuss the research and ensure that all collaborations are disclosed.

NIST also stated in its response that we did not discuss the projects with the ATP project managers. That is not true. Although we did not discuss all 114 projects with the project managers, we did hold numerous discussions with ATP officials, the Deputy Chief Counsel assigned to NIST, and several NIST laboratory scientists. In addition, for several intramural projects, including the In-situ Catalyst and Materials project cited in NIST's response, we asked for and received answers to our questions in writing.

The second project referred to in NIST's response (Selective Targeting of the HIV-1 Binding Site on the CC-CKR5 Receptor, a Seven Transmembrane Receptor Required for HIV-1 Entry and Fusion) was *not* included in our list of concerns about appropriate research. Hence, it is unclear what point NIST is attempting to make.

In the case of the In-situ Catalyst and Materials project, we included the project in the report because of what we believe is ATP's inappropriate funding of an intramural project that is closely linked to an ATP grantee. For instance, in the intramural project proposal, the NIST scientists state that the project's fiscal year 1998 major focus would be the ATP grant project as well as improvements to the research facility. This is a facility designed and built in a collaboration between the NIST scientists and the ATP grantee. The project proposal goes on to state that the facility was built with support from the ATP intramural program and is named after the ATP grantee. NIST, in its written response to our question, said that the NIST scientist was verbally instructed which work was not appropriate for ATP funds, and ATP did not provide any funding for that work. However, the final report showed that the NIST scientists continued to work closely with the ATP grantee, even referring to them as "our partners."

III. Project Performance Is Not Being Adequately Addressed

We found little evidence that ATP managers evaluate the results of the intramural projects. The managers told us that they established two primary program goals and objectives for the intramural projects--ensuring that industry will have the standards and measurements needed in the future, and providing the NIST laboratories with the seed money to develop new capabilities. They further told us that they evaluate a project's success in meeting these goals and objectives based on the submission of final reports, contributions to workshops, publication of papers, input from the ATP grantees, and the program manager's interaction with NIST scientists. In addition, ATP's policies require program managers to track accomplishments. However, other than copies of the final report, they could not provide us with any of the aforementioned information. Moreover, our review of the 114 fiscal year 1998 reports found that not all reports included the information needed to properly evaluate the projects to determine if results were achieved and goals and objectives met.

ATP policies require that scientists submit acceptable final reports for each project before they can receive additional intramural funding. The scientists are to use the report format provided by ATP. For fiscal year 1998, the format required that reports include the milestones and objectives of the research, a two-to-three page summary of the progress against all technical objectives, and a list of the publications and presentations submitted or accepted that resulted from the research. However, not all final reports followed the format. For instance:

- Ten reports did not clearly show what research was accomplished because the summaries did not address the technical milestones and objectives approved by ATP or identify the work performed with the ATP funding.
- Eleven reports did not include a list of the publications and presentations, or describe how the research results would be transferred to the ATP grantees and other interested parties.

Because the final reports did not always include the necessary information, ATP managers could not properly evaluate the results of the projects or address performance issues.

As GAO recently testified "Obtaining more credible results-oriented performance information is essential for (1) accurately assessing agencies' progress in achieving goals, and (2) in cases where sufficient progress is not being made, for identifying opportunities for improvement."² Performance evaluations are an important aspect of internal control because they enable NIST and ATP officials to properly assess the effectiveness of the intramural projects in meeting ATP's goals and objectives. Performance evaluations also provide the information needed to

² *Government Management: Addressing High Risks and Improving Performance and Accountability*, GAO/T-OGC-99-23, February 10, 1999.

support decisions for funding follow-on research, assess the effectiveness of management decisions, and evaluate the results of the recent policy changes discussed earlier in this report.

Recognizing the importance of program evaluations and results, the Congress enacted the Government Performance and Results Act of 1993. This act requires agencies to clarify their mission, set strategic and annual performance goals, and measure and report on performance toward those goals. To comply with the act, the Technology Administration, NIST's parent agency, has established performance measures and goals related to ATP. However, because ATP is not evaluating the intramural projects, the results of the projects cannot be included in ATP's overall performance results. We discussed this issue with the ATP official responsible for evaluating ATP's performance. The official told us that ATP recognized the need for evaluating the intramural funding, but no decision has been made as to whether the projects should be included in the laboratories' or in ATP's performance measures and goals. We believe that the intramural projects should be linked to ATP performance measures and goals because the purpose of the research is to perform standards development and technical activities in support of the ATP mission.

Recommendation

We recommend that the Director of NIST ensure that all final reports include the information needed to evaluate performance and track accomplishments, and develop and implement policies and procedures that (1) require ATP managers to evaluate performance and (2) link the intramural funding results to ATP's performance measures and goals.

NIST Response

NIST agreed to provide more training to ensure that its scientists include the information needed to evaluate performance and track accomplishments. NIST also stated that ATP has begun to take the appropriate steps to conduct evaluations to link intramural funding results to ATP's performance measures and goals.

OIG Comments

NIST's proposed actions meet the intent of our recommendation. Accordingly, the recommendation is considered resolved.

IV. Current Method for Disseminating Research Results May Limit Program Impact

Intramural projects provide standards and measures needed by the grantees for deploying their ATP-developed technologies. Under the ATP statute, ATP must ensure that the research results are disseminated to its grantees. However, our interviews with three grantees raised a concern

about the effectiveness of ATP's dissemination methods because two of the three did not know about ongoing intramural research that could potentially benefit their own research.

According to the ATP managers we interviewed, they rely on workshops and conferences to let the grantees know about ongoing intramural research. To better understand how well this is working, we contacted three grantees who were listed as beneficiaries of the research on four intramural proposals. One of the projects, Materials Processing, was associated with a specific ATP grantee's project, and the NIST scientists worked directly with the ATP grantee. For the other two intramural projects, the NIST scientists did not work directly with grantees. In our interviews with the three grantees' scientists, we found that only the grantee working directly with the NIST scientists on the Material Processing project was aware of the research being conducted. This grantee spoke very highly of NIST's assistance. The other two grantees said they were unaware of the research being conducted, although one of them had attended recent workshops put on by ATP, and both stated that the research addressed areas of great interest to them.

We recognize that the experiences of three companies are not statistically significant. However, we believe these experiences raise concerns about whether ATP's current practices of relying on workshops and conferences to publicize this research is sufficient. Additional procedures, such as posting proposed research and final project reports on NIST's Internet web site, could help ensure that all interested parties are made aware of any ongoing research in their area.

Recommendation

We recommend that the Director of NIST develop additional methods for disseminating the results of intramural research, including posting notices of ongoing research topics and copies of final reports on NIST's Internet web site.

NIST Response

NIST replied that its current practice of publishing papers and utilizing workshops is an effective method for disseminating the intramural project research results. However, it agreed to consider our recommendation by exploring additional methods for disseminating the research results, including using the NIST Internet web site. It also agreed to review the intramural program at ATP kick-off and annual meetings.

OIG Comments

We are pleased that NIST is looking for new methods for disseminating the intramural project research results. However, we believe that posting the intramural project topics and reports on the Internet is a very effective method for disseminating research results and deserves more than just consideration. In addition, the Paper Work Reduction Act of 1995 requires that federal

agencies provide for the dissemination of public information on a timely basis, on equitable terms, and in a manner that promotes the utility of the information to the public and makes effective use of information technology. Accordingly, we reaffirm our recommendation.

V. Documentation of ATP Management Decisions and Approvals Is Not Adequate

ATP's level of documentation did not meet internal control standards because the intramural project files (1) did not clearly show that ATP program managers were monitoring project research or approving changes in research direction and milestones, and (2) did not always contain the approvals and material transfer agreements needed to protect NIST's right to the research results when its scientists collaborate with non-NIST scientists or work with proprietary information. For example:

- For the 14 of 114 final project reports that identified changes in research direction or planned milestones, the files contained no documentation on whether the ATP program manager was aware of and approved the changes. Ensuring that ATP approves material changes in research direction is important because such changes would affect the research results and thus the benefits to the ATP mission. For instance, a scientist received \$120,000 to perform research on high performance polymeric composites. However, because the material was not available, the work was not completed as planned. Instead the scientists wrote about new results using the composite material that was the subject of the 1997 intramural project. Studying the previous year's materials may be beneficial to the laboratory, but not necessarily to ATP. Yet, we found no evidence that the ATP project manager knew of the change and approved it.
- None of the 114 project files contained any indication of whether the ATP program manager was satisfied with the intramural project's research work, although we found some questionable results. For example, ATP awarded a \$100,000 grant to a NIST researcher to study and perform research on high-definition video. What ATP received was attendance and participation in three standards committee meetings, consultation with ATP staff, and reviews of ATP proposals. Although ATP managers told us that attending these meetings met the project's objective, the file contained no evidence to that effect. It was not clear to us how attending three meetings and reviewing ATP proposals fulfilled the approved milestones, or why doing so cost \$100,000.
- For the 14 projects where work was not completed as planned, the files did not indicate whether ATP had requested its money back or taken some other appropriate action. This was true even when significant problems were disclosed. For instance, one researcher complained that he could not perform the research as proposed because the laboratory was not committed to the work and had spent a portion of the money on another project. However, we found no evidence that ATP acted upon the researcher's complaint.

- The files did not always include sufficient information to tell whether the research was to be carried out during the year or over multiple years, or how many years it would take to complete. Without such information, managers may be approving projects without knowing the true cost of the research or how long it will take before ATP will receive the expected results.

ATP documentation should be improved to show the extent of project monitoring and ensure that NIST scientists obtain all required approvals and authorizations. This information is needed to meet internal control standards. Effective internal controls provide managers with reasonable assurance that the agency's operational objectives are being met, financial reports are reliably prepared, and laws and regulations are being followed. As previously discussed in the report, GAO's *Standards for Internal Controls in the Federal Government* provides guidance to help agencies establish and maintain effective internal control systems. For instance, GAO's guidance requires all transactions and significant events to be clearly documented and readily available for examination. The documentation should be complete, be accurate, and allow for tracing the transactions and events before they occur, while they are in process, and after they are completed.

We discussed these issues with ATP managers, who stated that they are in constant contact with the participating laboratory scientists, and were fully aware of results of the research and any changes that occur or problems that arise. They also furnished us copies of the material transfer agreements. Nevertheless, when ATP is spending between \$9 million and \$14 million annually for a program of this importance, proper accountability requires that management decisions and approvals be documented. Without such documentation, ATP managers cannot demonstrate that they are properly overseeing the use of program funding and ensuring that intramural projects are benefitting ATP's mission.

Recommendation

We recommend that the Director of NIST implement policies and procedures requiring that the intramural project files contain written documentation that meets GAO internal control standards. At a minimum, these policies and procedures should require that program managers document management decisions and keep copies of required approvals and authorizations.

NIST Response

NIST agreed that project files should include written documentation of management decisions and significant changes. It also noted that all initial intramural project approvals were included in the files. However, it argued that few changes warrant written approval, reasoning that the nature of generic basis research is such that change is to be expected, and requiring written documentation of each change is unnecessarily burdensome and not cost effective. NIST further argued that ATP's existing policies that require major changes to be discussed with the project

manager are sufficient. Nevertheless, it agreed to provide training to NIST scientists that included the requirement that major changes be approved and documented.

NIST also commented on one of our examples included in the report, a \$100,000 intramural project on high-definition video. We reported that the scientist working on the project did not perform the work approved by ATP. Instead, ATP received attendance and participation in three standards committee meetings, consultation with ATP staff, and reviews of ATP proposals. While NIST acknowledged that the project's final report made reference to the review of ATP proposals, it stated that this was not the purpose of the intramural project and no intramural funds were used for that purpose. NIST further argued that the ATP project manager was in constant contact with the NIST research and was aware of the scientist's contributions to the project.

OIG Comments

NIST's response centers on the extent of monitoring that the intramural projects require. According to NIST, few changes to the intramural projects are so major as to require approval. ATP only requires major changes to be discussed with the project manager to ensure that the change is still consistent with the generic scope of the originally proposed effort. Nevertheless, NIST agreed to include in its training the requirement to adequately address any major changes in advance with the ATP project manager and document it as appropriate.

However, NIST's response does not adequately address our finding and recommendation. Our report does not focus on whether NIST is properly monitoring the intramural projects. Rather, the report addresses the need for written support to show that ATP project managers are properly managing the intramural projects. For instance, as we state in our report, according to ATP, there is a significant amount of interaction between ATP project managers and the NIST scientists. However, the files contained little, if any, documentation of any follow-on interaction. If, as NIST asserts, ATP project managers are kept fully informed of changes and work closely with the NIST scientists, we see no reason why the results of these interactions cannot be documented in the project files.

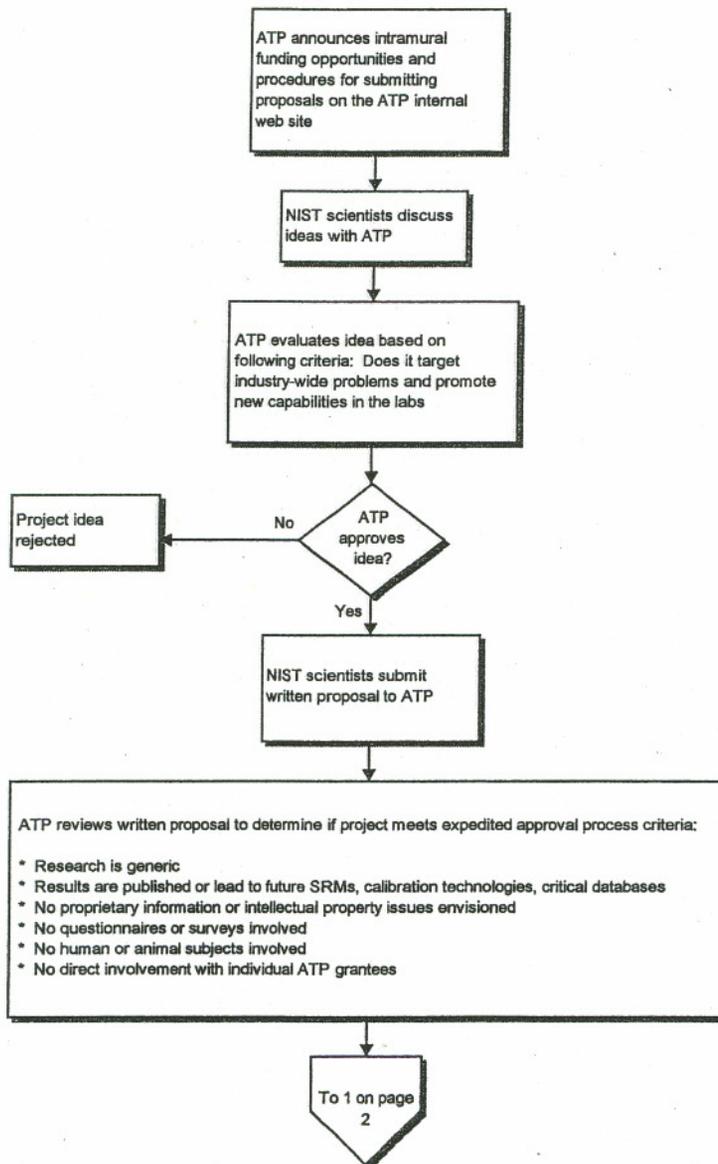
In addition, ATP officials told us that they require the NIST scientists to obtain material transfer agreements and similar types of approvals before ATP approves and releases the intramural funds. These approvals are important because they protect NIST's ability to release the research results to the public. However, the officials rely on verbal notification from the NIST scientist that the agreement had been obtained. Because of the importance of these approvals, we believe that copies of these agreements should be included in the intramural project files.

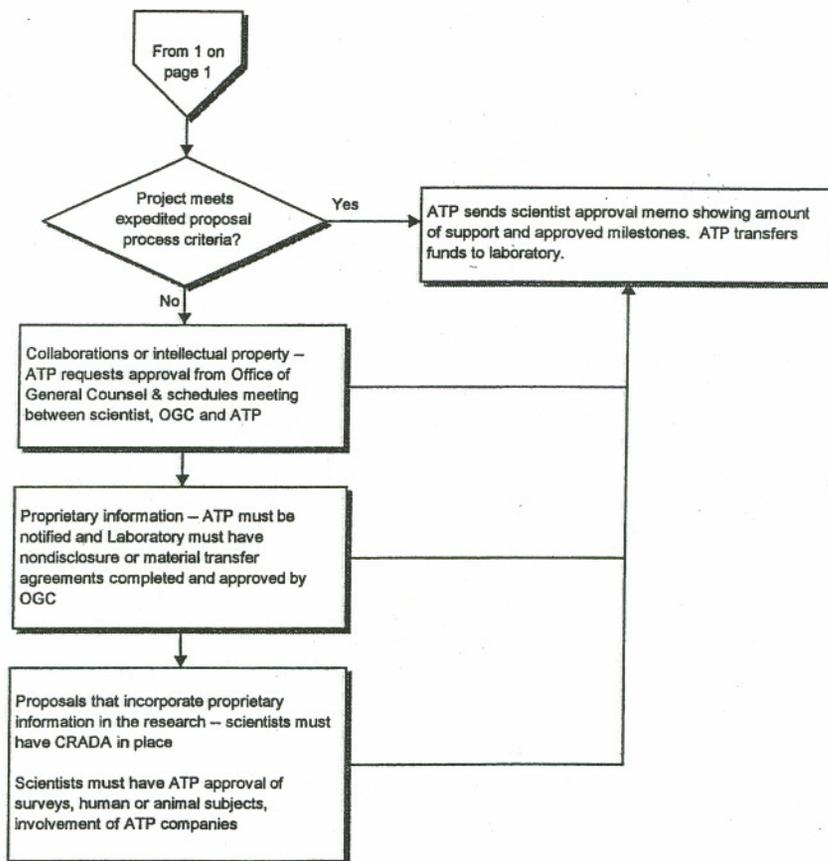
NIST also agreed to provide training to its scientists on the need to adequately address major changes in advance with the ATP program manager and document them as appropriate. However, this action is not fully responsive to our recommendation. We recommended that NIST implement

policies and procedures requiring that intramural project files contain written documentation that meet GAO internal control standards. Accordingly, we reaffirm our recommendation.

NIST also requested that we delete a statement in our example that questioned the results of an intramural project on high-definition video. The statement referred to the scientist's use of ATP intramural funds to review ATP proposals. NIST argued that it is improper to use the funds for that purpose. According to NIST, although the final project report referred to the review of ATP proposals, that was not the purpose of the intramural project and no intramural funds were used for that purpose. However, NIST did not furnish us with any documentation to refute its scientist's statement and our review of the accounting records found that the records do not include that type of information. Without any support, we did not revise the report as requested.

NIST Procedures for Solicitation, Review, and Selection of Intramural Research Projects







NIST

APPENDIX II
UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899
OFFICE OF THE DIRECTOR

MAR 16 2000

MEMORANDUM FOR Mary L. Casey
Acting Inspector General for Auditing

From: Raymond G. Kammer
Director

Subject: ATP's Management of Intramural Research Can Be Strengthened
Draft Audit Report STD-11551-0-XXXX

Thank you for the opportunity to comment on the subject draft audit report. The following comments are provided:

Page i, first bullet:

OIG Finding: "ATP's formal written policies and procedures for intramural projects should be updated to reflect the current process. In addition, to ensure that all NIST scientists are fully aware of availability of intramural funds, the updated policies and procedures should be included in the *NIST Administrative Manual* (see page 2)."

NIST Response: Formal written policies and procedures for intramural projects are updated annually to reflect the current processes. These written policies and procedures are formally transmitted to the NIST Operating Unit (OU) Directors from the Director of the Advanced Technology Program (ATP). The guidance includes: the operational characteristics of the ATP intramural funding, format for submission of intramural proposals, and format for submission of annual intramural reports of accomplishments. For the past several years, the guidance provided by the ATP Director to the OUs clearly reflects updated policies and procedures to ensure that the OUs are fully informed of the availability of intramural funds. The procedures in place are well documented and have proven to be very effective. We will take into consideration the recommendation to include the intramural policies and procedures in the *NIST Administrative Manual*.

Page i, second bullet:

OIG Finding: "ATP should ensure that its policies and procedures emphasizing generic research and requiring approval of collaborations are followed. For 14 projects we found that the research appeared closely linked to a specific ATP grant, and for 15 projects NIST scientists did not obtain approval for their outside collaborations (see page 4)."

NIST Response: The current policy, which was also in effect in FY98, requires that an intramural project be one of generic basic research. This type of research cannot provide any ATP awardee with undue advantage because of the nature of the research and the requirement that the results be published in the open literature. Collaborations that are approved in advance through ATP and NIST legal counsel must be in support of only generic basic research that will broadly benefit a technical community. All collaborations not meeting that requirement are not approved. Further information in response to this OIG finding is provided below.

Page i, third bullet:

OIG Finding: “**Project performance should be evaluated.** We found little evidence that ATP is evaluating the performance of the research projects. Consequently, performance issues cannot be adequately addressed, and managers cannot properly assess the effectiveness of their decisions (see page 7).”

NIST Response: We recognize that a formal evaluation process for the intramural projects has not been implemented. We currently rely on the final project reports to identify results. ATP has begun to take the appropriate steps necessary to ensure that intramural projects will be subjected to the same performance measurement criteria that are applied to ATP funded projects by the Economic Assessment Office.

Page ii, first bullet:

OIG Finding: “**More effective methods for disseminating research results could help improve program impact.** For example, two of three ATP grantees we contacted were unaware of potentially beneficial research. Although this small sample is not statistically significant, it does raise concerns as to whether ATP’s current practices of relying on workshops and conferences to publicize this work are sufficient (see page 8).”

NIST Response: ATP’s goal is to ensure that results of research are made public. The current practice of publishing papers and utilizing workshops and conferences to do this has been very effective. However, we will take this recommendation under advisement. We are exploring additional avenues for disseminating the results of intramural research.

Page ii, second bullet:

OIG Finding: “**Project files should contain written documentation of management decisions and significant events, as well as copies of needed approval.** Without such evidence, ATP managers cannot effectively demonstrate that they are properly monitoring the projects, and ensuring that all approvals have been obtained before releasing funds (see page 9).”

NIST Response: We agree that project files should contain written documentation of management decisions and significant changes and have made every effort to ensure that this is

accomplished. All initial intramural project approvals are clearly documented and this was provided to the OIG during the review. We disagree that every change warrants a written approval. The nature of generic basic research is such that change is to be expected and requiring written documentation for each change is unnecessarily burdensome and not cost effective. NIST scientists work very closely with the ATP project managers who are kept informed of changes and oral approvals are appropriate for minor changes.

Pages 2-4, I. Selection Process Is Adequate, but Policies and Procedures Are Not Up to Date:

OIG Finding: "We found ATP's selection process for intramural projects to be adequate for selecting intramural projects that meet legislative requirements. However, ATP's written policies and procedures, which date back to 1993, do not reflect the current process and should be updated."

NIST Response: We disagree with the OIG that ATP's written policies and procedures do not reflect the current process. As discussed above, the ATP policies and procedures are updated annually and disseminated to the OUs. We especially take exception to the OIG comment found on page 4, first incomplete paragraph, which states "However, ATP's written policies and procedures still require that intramural projects be directly linked to specific ATP grantee problems." This statement is inaccurate and should be deleted from the OIG report. The guidance found in the memorandum dated August 18, 1997, to the OU Directors from the former ATP Director specifically stated, "In 1997, ATP decided to shift the intramural funding emphasis to generic projects which cut across a focused program or groups of ATP projects to provide the measurement and standards which will facilitate the deployment and diffusion of ATP-developed technologies. We have distinctly moved away from intramural support keyed to individual ATP projects and companies, or support which may depend on proprietary information supplied from a company although such support will be considered on a case by case basis. We expect benefits to the companies to emerge from open publication of results of intramural projects."

Pages 4-6, II. Concerns About Appropriate Research and Collaborations Remain:

OIG Finding: "Our review of 114 intramural project files identified 14 projects in which the NIST scientists indicated that they worked closely with an ATP grantee, thus providing a direct benefit to a specific ATP project."

NIST Response: As stated above, ATP requires that an intramural project be one of generic basic research. This type of research cannot provide any ATP awardee with undue advantage and research results must be published in the open literature. Collaborations that are approved in advance through ATP and NIST legal counsel must be in support of only generic basic research that will broadly benefit a technical community. All collaborations that do not meet that requirement are not approved. In almost every instance, the collaboration activities were approved in advance by ATP and NIST legal counsel. The OIG may not have understood the

nature of using “non-proprietary materials” provided by a company, or procured through normal commercial routes. The OIG understandably may not have the technical expertise to distinguish between a generic technique that will be published in the open literature and a proprietary research task. In one project (“In Situ Catalyst and Materials ...”), it was necessary for the OIG to understand the difference between the use of Ti-silica supports with particular deposits, and Ti-alumina supports in making particular generic measurements that would be published in the open literature.

In another project (Selective Targeting of the HIV-1 ...), it would have been again necessary for the OIG to discuss the technical scope of both the intramural and ATP projects with the ATP project manager to understand their differences. The ATP intramural project focuses on the protein function, while the ATP award focuses on the DNA function. The only similarity is that both projects use the CC-CKR5 receptor. The intramural results are of no direct benefit to the awardee, but they do provide generic information that better describes the biological system being used that will broadly benefit the technical community. The broad benefits of the intramural basic research would only be clear to a technical expert in the field without specific discussion on the issue.

OIG Finding: “We also identified 15 projects in which NIST scientists did not receive approval for their outside collaborations.”

NIST Response: In almost all instances all collaborations were approved in advance through NIST legal counsel and ATP, however, we recognize that improvements can be made to document these approvals. ATP will make every effort to ensure that proper documentation is readily available. ATP has already implemented a procedure whereby the ATP Administrative staff maintains a record of all projects that received NIST legal review.

It should be understood, however, that informal collaborations are essential and may not always require prior approval and written documentation. This type of collaboration is one where a scientist may call another to discuss research results that have been placed in the public domain, either through publication or presentation. Sometimes these types of ‘consultations with experts’ are mentioned in final reports; these are an indication of improved technology diffusion, which ATP supports. These types of collaborations do not present a risk of losing intellectual property rights to another institution or person that could diminish the technology diffusion of the research results. In fact, these types of collaborations are at the very heart of the type of technology diffusion model that has excellent results for basic generic research. Collaborations enhance technology diffusion, therefore, as long as the research is basic and generic – to be openly published, there is little danger of intellectual property issues pinning the research results to a particular party instead of being available to the scientific community as a whole.

In accordance with the OIG recommendations, NIST will 1) clarify the types of collaborations that require approval, and 2) provide training to all NIST scientists on the policies and procedures governing research and collaborations. With respect to the OIG’s recommendation

that project managers meet regularly with NIST scientists, project managers currently have regular discussions with NIST scientists regarding the intramural projects. This informal method of communication has been very effective, however, we will take under advisement the OIG recommendation to have regular meetings.

Pages 7-8, III. Project Performance Is Not Being Adequately Addressed:

OIG Finding: “We found little evidence that ATP managers evaluate the results of the intramural projects. . . Ten reports did not clearly show what research was accomplished because the summaries did not address the technical milestones and objectives approved by ATP or identify the work performed with the ATP funding. Eleven reports did not include a list of the publications and presentations, or describe how the research results would be transferred to the ATP grantees and other interested parties.”

NIST Response: ATP’s current procedures require that final reports be prepared and submitted prior to receiving renewed funding. These final reports must be acceptable to the project manager. The final reports must list all research accomplishments and generally list any related publications. However, in some instances the research may be in the early stages of a multi-year effort and no research results may be ready for publication or presentation. To ensure that the NIST scientists are aware of the importance to include in the final report the information needed to evaluate performance and track accomplishments, appropriate training will be provided as indicated above. Additionally, as stated above, ATP has begun to take the appropriate steps to conduct evaluations to link the intramural funding results to ATP’s performance measures and goals.

Pages 8-9, IV. Current Method for Disseminating Research Results May Limit Program Impact

OIG Finding: “More effective methods for disseminating research results could help improve program impact. Under the ATP statute, ATP must ensure that the research results are disseminated to its grantees. However, our interviews with three grantees raised a concern about the effectiveness of ATP’s dissemination methods because two of the three did not know about ongoing intramural research that could potentially benefit their own research.”

NIST Response: ATP’s goal is to ensure that results of research are made public. The current practice of publishing papers and utilizing workshops and conferences to do this has been very effective. However, we will consider the OIG’s recommendation that additional methods, such as posting notices of ongoing research topics and final reports on NIST’s Internet web site, be developed for disseminating the results of intramural research. ATP will also review the intramural program at kick-off and annual meetings as appropriate.

Page 9-11, V. Documentation of ATP Management Decisions and Approvals Is Not Adequate:

OIG Finding: "ATP's level of documentation did not meet internal control standards because the intramural project files (1) did not clearly show that ATP program managers were monitoring project research or approving changes in research direction and milestones, and (2) did not always contain the approvals and material transfer agreements needed to protect NIST's right to the research results when its scientists collaborate with non-NIST scientists or work with proprietary information."

NIST Response: Basic generic research plans by their nature are written to be flexible enough so that the principal investigator can make minor modifications to the plan based on research results during the project. All do not require prior approval, and few changes are so major as to require approval. Research plans are to take possible alternative approaches into account when developed, but it is not possible to capture all possible approaches in advance. This is the nature of basic research. This also is not contract research, where not meeting a milestone results in termination of a project. It would be unduly burdensome to require the level of monitoring that contract research requires. These types of projects have more in common with grants for basic research than with contracts. Basic research grants typically are funded based on a proposal with a general approach outlined, with the understanding that the principal investigator is to take appropriate advantage of research results along the way to better direct the scope of the effort. The final report then outlines the research results in a publication such that another scientist could duplicate the findings as needed in other research efforts. ATP's focus on publishing research results supports this approach. Basic research grants typically do not require prior approval for all changes from the original proposal. ATP only requires major changes to be discussed with the project manager to assure ATP that the change is still consistent with the generic scope of the originally proposed effort. In accordance with the OIG's recommendation, training to be provided to the NIST scientists will include the requirement to adequately address any major changes in advance with the ATP project manager and document it as appropriate.

Page 10, first incomplete paragraph:

OIG Finding: "ATP awarded a \$100,000 grant to a NIST researcher to study and perform research on high-definition video. What ATP received was attendance and participation in three standards committee meetings, consultation with ATP staff, and reviews of ATP proposals."

NIST Response: Intramural funding is NOT used to pay for NIST scientists to review ATP proposals; therefore, this statement should be deleted from the report. While we acknowledge that the final report from the principal investigator made reference to the review of ATP proposals, this was not the purpose of the intramural project and no intramural funds were used for this purpose. The focus of the intramural project was very specifically tied to a particular standards effort and not likely to contribute to effectiveness in the review of proposals. The results of the intramural project are clearly described in the final report which include trip reports to the standards meetings. Participation in these standards meetings, in particular, participation in the Society of Motion Picture and Television Engineers (SMPTE) working groups, was essential for the purposes of the project. There is a major difference between attending standards

meetings and participating in one. Participation in a standard setting body such as SMPTE requires a great deal of research which was the subject of this intramural project. The report summarized the research done in splicing technology and audio in compressed domain. Results of milestones 2 and 4 are more readily visible in the two trip reports attached to the final report. ATP project managers were in constant contact with the researcher and were aware of the contributions to the project. From ATP's viewpoint the objective of this research were achieved.

We hope these comments will be helpful to the OIG. Any questions concerning these comments should be directed to Barbara Lambis (301-975-4447) or Terri Talbott (301-975-2306).